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COMMUNICATION

TO THE

CITY COUNCIL,

ON THE SUBJECT OF INTRODUCING

WATER INTO THE CITY.

PRINTED BY ORDER OF THE COMMON COUNCIL.

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CITY OF BOSTON.

Gentlemen of the City Council.

The 12th Section of the City Charter enjoins it on the Mayor to communicate, for the consideration of the City Council, such topics and matters as may seem to him to be deserving of the notice of that Body. Equally on account of its extreme as well as its paramount importance, it is, in my judgment, incumbent on me even at this early hour, to recommend to your grave attention the subject of bringing an ample supply of pure and fresh water into the City of Boston.

The wells now in Boston may be divided into four general classes. The first is the surface or top water well. These wells are supplied by the soakings or top water. They are found in a layer of sand or of gravel and sand, resting on the body of clay, which constitutes the proper foundations of the town. They seldom exceed twenty or twenty-four feet in depth, commonly yielding good water, for the most part less hard or brackish than the general character of the City Water. But it is evident that, as the surface of the ground becomes covered with buildings and as the streets are more generally paved so as to allow the water to run off, the supply of these wells will diminish and as excavations increase and are crowded into narrower limits, the quality of the water will degenerate. This class of wells, being probably about one in ten in the whole town, is necessarily much affected by impurities that soak and filter through the soil.

The next class, embracing the greater part of our wells, is that which is found under the first bed or pan of clay. Their depth varies exceedingly, running from 80 to 100 feet on the eminences, and on the flat parts of the town from 30 to 40 feet. The pan, below which the water is found, consists of a hard clay of a bluish cast, mixed with loose stones, generally of a small size, though occasionally one that requires a blast. In the language of geology there are no rocks on the peninsula " in place," with the exception of a variety of gray slate, which is met with at a considerable depth, running apparently from a point near the Massachusetts General Hospital, along the Mill Pond and towards the North End. The general nature of the soil or formation can easily be seen by looking at a section of Fort, Copps or Beacon Hills, cut down where new streets are building.

The bed or pan of clay itself contains no water but flaws or spits of sand that follow the dip or pitch of the ground. I am led to think that these wells, whether on the high or the low land, are supplied from the same stream or under ground brook. This stream appears to enter the town on the north, spreads under the water proof covering of clay I have mentioned, finally discharging itself somewhere into the salt water. I infer that the head in the country is not high from the circumstance, that the water seldom rises in any of our wells more than eight or ten feet. The stream generally circulates in a layer of sand of a sharp grit, though also found in gravel. When first reached, this sand appears hard and solid, much like the beach of the Sea, but upon being opened with a bar or pick axe soon becomes loose, the water penetrating it freely. This water is hard or brackish, containing common salt and a portion of calcareous matter (Paris Plaister) dissolved ;—these impurities being in considerable quantities as is evident from the deposit copiously and readily made on a Tea Kettle. I have now in my possession a piece of crust, nearly a fourth of an inch thick, taken from the bottom and side of a common boiler where it had been suffered accidentally to accumulate. This deposit was made in forty-three days. There was water constantly in the boiler, though probably not always in a state of evaporation. The well, from which this water was drawn, is on an estate, that has been occupied at least a century.

The water of this class of wells derives its salt impregnation principally, I presume, from the bed or layer of sand and gravel in which it stands or circulates. That this stratum was once steeped in the sea water seems evident from the fact that at the bottom of wells, beach or tide-worn pebbles often, and clam and oyster shells occasionally are found Shells of this sort have been seen in wells on Copps Hill fifty feet below the surface.

Many of these wells (probably more than is imagined) are affected by the tides. It was ascertained by a course of experiments about thirty years ago that the well on Beacon Hill in the State House yard fell and rose with the ebb and flow. This well is nearly 100 feet deep. It is in my power to recite many other facts of the same kind ; but for the present I shall confine myself to one. When the walls, enclosing the present Mill Dam, were completed and the water withdrawn from what is called the empty basin, a great number of wells, east and south east of the Common, were dried, but on sinking them six or eight feet, water was again found. It is, therefore, evident that whether the stream, which passes beneath the town, discharges itself into the salt water above or below low water mark, the stream itself will be more or less backed when the tide rises.

Fresh water is also found in a stream that appears to pass under the pan of the harbour, water having been found by boring through clay on an average from 80 to 120 feet both on the Mill Pond and a part of the Mill Dam flats. Very good water in some of the low parts of the town is also drawn up by means of a hollow log, first passing below two layers of clay and two of a black sand drenched with salt. The two last classes of wells are, however, not numerous.

The water in the sand or gravel (or the top water wells) must degenerate as impurities are collected on or under the surface, but the water under the clay, which is really impervious, ought to improve for the substances, that impart to it hard or brackish qualities, are yearly more diluted. Still, many foul matters undoubtedly and unavoidably penetrate into these wells and gradually drain and drip to the bottom.—On the whole, there is abundant reason to believe that the well water in the City, has generally speaking, become worse and from causes unavoidable, wherever a large and compressed population is assembled. I believe it also to be true as a general remark that the supply in the old parts of the town is inadequate, and that in the new, more especially those over which the population will soon spread, it is now exceedingly difficult (and of course will always continue so) to procure tolerable water even in limited quantities and at a great expense.

In the memory of many persons, even those little advanced beyond the middle age, there existed in different parts of the City, copious and flowing springs of soft water, that have either become hard or of which no trace now remains. But some portion of this water has undoubtedly been drawn off into the private wells that have been built in the neighbourhood, for as the water under the clay must come from a distance, it is not easy to understand how the absolute quantity on the Peninsula can be diminished by any use there. The supply, indeed, may be intercepted by an increase of population in Charlestown or other towns near this, for it is a matter susceptible of immediate proof that a well, on the other side of Charlestown Bridge was dried in a very brief space by another sunk at the north part of Boston.

Another great and general supply of water is from cisterns. Little need be said on this head. This description of water unavoidably degenerates in proportion to the increase of population. Not only a greater accumulation of soot, especially where the English or bituminous coals are used, takes place on the roof of houses, but dust and other foul matters blow up from the streets and lodge or collect in the gutters and stain and contaminate the water. Particularly after a sudden and heavy shower or the melting of snow, when the coal smoke that had rested upon it, descends immediately with the water into the cistern, this water will be found to have a distinct smoky taste.

At all times the atmosphere over a large City is impure, especially at those seasons when the exhalations are profuse. Our rain water first filters through this tainted stratum.

The third and last source of supply of water is from the Boston Aqueduct Company. This Company now furnishes about 1000 families at an annual cost of from 10 to 12 50-100 dollars. The water is procured from Jamaica Pond, which could probably deliver a much larger quantity if artificial means were employed to raise the head. Following the fire plugs, this water runs as far north and east as Congress and West Streets, and as far north and west as North Russell Street. The water of Jamaica Pond is remarkably soft.

The Boston Aqueduct Company, moved by a laudable spirit of enterprize, commenced this undertaking at an early period and they have continued and sustained it with a degree of perseverance that has proved highly beneficial to a portion of the citizens. It will, however, readily occur to the mind of every one that this Company must feel a deep interest in the settlement of a question, that cannot but materially affect the value of their property.

Before proceeding to the main topic of this inquiry, I have thought it proper and necessary to present an account, equally brief and general, of the actual condition of our wells and well water. At the same time I am fully aware that it is subject to a great number and variety of local exceptions.

It remains, however, still to speak of the effect of our present water on the health. And as it respects this matter, I cannot do better than recite the opinions of the consulting Physicians of the City with which at my request they have been so obliging as to furnish me.

" More than twenty years ago, I made a careful analysis of water, from different parts of the town and found it to contain impurities, varying in the different specimens; but which generally exhibited a considerable admixture of vegetable and animal matters and not less than eight or ten foreign salts or saline substances. The saline incrustations in vessels, in which the common water has been long used in a boiling state, show the abundance of foreign matter it contains.

" The impression made by these observations led me to notice the effect of the City water on various constitutions and on the production of diseases.

" From these inquiries I can state, as a result to be relied on, that the water, commonly used, is apt to produce and to maintain disorders of the stomach and digestive organs and that there are cases of these affections, which cannot be removed, so long as its use is continued.

" As many fevers are generated by derangements beginning in the digestive organs, I have been led to believe that this impure water is not an unfrequent cause of fever: and certainly whenever there is an epidemic disposition to fever, bad water must act as an important cause in determining its developement.

" The difference in the effect of pure water and water impregnated with saline substances in cooking is generally known. But the influence it must have on the animal economy does not seem to be sufficiently estimated.

"The operation of articles of food, subjected to the action of brackish or saline water, must be to some extent injurious. Vegetable food, especially, when prepared in this way is unwholesome and may be a cause of positive disease." [*Dr. Warren.*]

"I believe the water from our wells is in a degree unwholesome, predisposing some to calculous and others to bilious disorders. The rain water is not fit for use. The soot and other impurities on the roofs thicken it and the leaves dye it in such a way that it will barely do to wash with.

"I have been a resident in Boston more than a third of a century and the population has tripled during that time. The water has very much deteriorated in particular places within that time and I thence infer that it has generally. The large boiling spring west of the High School furnished the best of water for the coloured people to wash with, and for the houses in Chesnut and Charles Streets, but has nearly ceased to run and has become hard. The spring on Pemberton's Hill supplied the upper parts of Hanover and Ann Streets, but has nearly or quite failed. A spring, very soft and affording much water at the upper part of old Temple Street, has become hard and the water much diminished. The public well in Scott's Court, that 30 years ago produced excellent water, is unfit for use. The same may be said of the public well near the Boston Stone." [*Dr. Shurtleff.*]

"I am not aware that more than two analyses of the well water of this City have been published, and these were made some years since. It appeared by them that the character of the water was different in different parts of the City, being purer on the high ground than on the low. It was found to contain a small portion of common salt, some fixed air and a trifling quantity of Epsom Salts or the Sulphate of Magnesia. Water from some wells was also analyzed, which contained a minute quantity of iron. It is obvious that none of these would materially affect the health. But I apprehend the danger does not arise from those substances that are held in chemical solution in the water; but that it is rather from those foreign bodies that are merely mixed with it.

" In several cases of obstinate and long standing affections of the stomach and bowels, I have directed the patients to use soft water, instead of hard well water, and have been satisfied that the change has produced a very favorable effect." [*Dr. Hayward.*]

" As far as I remember the analysis, our water, besides earths, contains five or six kinds of the neutral salts; some of which I think were the following—Muriate of Soda, Carbonate of Soda, Sulphate of Soda, Sulphate of Magnesia, Carbonate of Lime, and some others. But I do not positively declare that I am right in each instance. One thing, however, I think I remember with clearness—that there was nothing poisonous in our water, or particularly unhealthy. These salts are such as we either take with our food, or employ as medicines; and some of them are such as we employ for the cure of Dyspepsia. I cannot therefore say that I think our Boston water, as water, is particularly productive of any particular form of disease. Yet there are other ways of considering the subject in a medical point of view, than the one to which I have adverted.

" Probably not less (this is guess work) than 30,000 persons are daily in our City, who do not belong to it, and probably as many more, who reside in the City, have not lived long enough with us to escape inconvenience from our water. If this conjecture be true, there is of course at all times in our City a vast number of persons who are sufferers from our saline water, (from the circumstance of not being habituated to its use,) a great proportion of whom, would be relieved of their troubles by the introduction to our City of pure country water; and this reason alone in my mind is sufficient to warrant the expense of its introduction. In addition to the above, however, it is probably true, that there are at all times in our City many individuals, who either from a peculiarity of habit, or from a peculiar condition of the digestive organs, experience much inconvenience from our saline water and who would be much benefited by one of a purer nature." [*Dr. Randall.*]

" I am not possessed of any proof that the inhabitants have actually sickened from bad water: still, it is my firm belief, that the supply of water is deficient both in quality and quantity. The laborers are subjected to much inconvenience from their distance from a supply of this necessary beverage. As labor has built the City, and as labor now maintains the City, I would that the City refresh her labourers with a full supply of the article as pure as furnished by the mountain stream, provided such water can be found and conveyed to the City within its convenient means."

"Let the people have this refreshment, with the addition of pure air, and all is done, that men can do, to prevent epidemic disease. Putting aside human life and human comfort, one sweeping epidemic may injure the property of the City, to a greater amount than the entire cost of an aqueduct to supply the City with pure water." [*Dr. Shattuck.*]

These learned gentlemen are unanimous and decided in the opinion, that the well water has grown worse, and that a supply of soft and pure water would essentially contribute to the health of the citizens, more especially in checking and subduing a disposition to epidemic diseases.

Probable quantity of soft water required.

From a tariff of rates of the New-River Waterworks, in London, I infer that the company allow a family 200 gallons a day. This quantity probably includes leaks, waste, water for fire-engines, for manufactures, and all other purposes not strictly culinary and domestic. Still, in reference to any quantity this City might propose to bring in, it would be necessary, not only to have regard to an increase in population, but one thing is quite certain, that the moment a supply of soft and pure water was obtained, a much greater use would be made of water than is now the case. The only general remark to be made, appears to be this, — that the supply should be so abundant, or rather bountiful, as to allow the people to use it, at discretion, for every purpose of comfort, cleanliness and convenience. It is also essential, that it should be distributed from a point so elevated as to rise freely into the upper stories. If water cannot be brought and distributed at this rate, and in this manner, it is not, in my judgment, desirable to undertake a work necessarily expensive and protracted.

I should not, therefore, put down the supply at less than 150 gallons daily to a family; — this, of course, to include all other purposes for which water would be used. The families here would probably average six persons, though this is one more than the tables abroad usually allow. If, however, the calculation stands at six, 150 gallons a family would, of course, give 25 gallons to each individual. A population of 70,000 (probably about our own at this time) would consequently require daily 1,750,000 gallons, without any allowance for increase of inhabitants.

Mr. Treadwell, for a population of 50,000 in Boston, (but allowing for increase) proposed 1,600,000 gallons. By a calculation I have from New-York, I find it is considered that 20 gallons a person would be a full and fair average. Col. De Witt Clinton, of the United States Topographical Engineers, gave, in 1833, 5,000,000 gallons, as necessary for the *immediate* daily wants of that City. The population of New-York, in 1830, was 213,470. The Fair-Mount Works throw daily into Philadelphia 4,000,000 gallons. The population of that City, including the liberties, in 1830, was 161,412; but as some distant parts are (I believe) not yet supplied at all, it is not in my power to make an average from these data. It is, however, the opinion of a gentleman, (of vast experience in matters of this sort, and to whom Philadelphia is under great obligations) that 150 gallons to a family daily is not too large an allowance, including all other purposes; though I am informed that the annual assessment for the Schuylkill water is founded on a calculation of 100 gallons to a family. It would not, therefore, seem either safe or wise to build an aqueduct that would not ultimately deliver daily into Boston from 2,500,000 to 3,000,000 of gallons.

Source of Supply.

From the best information I have been able to obtain, I am led to think that there are several places in this vicinity, from which a large daily supply of water can be procured. Two of these; more particularly, were surveyed and examined, in 1825, by Mr. Treadwell, a gentleman well known to be fully competent to the business. The report, made by him on this subject, was printed the same year by order of the Common Council of this City,

The places examined by Mr. Treadwell, (from which he also surveyed routes) are, first, — Charles river, which he proposed to tap above the falls at Watertown; and, second, — a large body of water on the southern edge of Stoneham, called Spot-pond. Watertown Falls lie west northerly, and Spot-pond is nearly due north from Boston. An aqueduct from Watertown would probably enter the City, with most advantage, on or at a point near the mill-dam. One from Spot-pond could be conducted either through the same point, or near Cragie's bridge.

The water of the river, at the place I have mentioned, not being sufficiently elevated for distribution, it would be necessary to raise it, by artificial means, into a reservoir. There are probably two spots out of the City, where a sufficient water power, for this purpose, could be obtained.

On the other hand, Spot-pond is 140 feet above the tide waters, — offering, on that account, full and immediate means for distribution to the highest land in Boston, simply and directly by the use of an aqueduct. This latter consideration is, in itself, an obvious and great advantage; for it is evident, that when it becomes necessary, in the outset, to pump into a reservoir all the water wanted for distribution, the lowest districts of a City require the same application of power as the highest. This objection seems to have more force than common, in a City of a surface so unequal and peculiar as that of Boston. At the same time, I think some doubt may well exist, whether the supply from Spot-pond would be steadily and permanently sufficient. At the season of the year when Mr. Treadwell undertook an examination of the waters of this neighborhood, it was not possible for him to obtain a survey of this pond, or lake, on account of the state and condition of its borders. He was, therefore, obliged to depend upon a survey, at present in the office of the Secretary of the Commonwealth. According to this document the pond contains 220 acres. But, of course, no attempt would be made to employ this or any other source, till the amount of supply could be ascertained in a scientific manner, aided by accurate observations of the condition of the waters for a period sufficient and satisfactory.

Mr. Treadwell supposed that Spot-pond would supply 1,600,000 gallons daily.

From the result of a rough experiment, though furnished by a careful observer, it appears that about 50 cubic feet of water pass over the Watertown falls every second during the twenty-four hours, at the lowest state of drought known in the river. This state of drought, though by no means annual, lasts usually from four to eight weeks. At other times, the river is much higher: for example,—in December, it is supposed that 300 feet passed as above explained. Fifty cubic feet a second would give 6,480,000 gallons for the 24 hours, in the lowest ebb of the river.

Neponset river is another source, that would probably afford an abundant supply. I think it, however, sufficient merely to allude to this as well as to ponds more distant than the one in Stoneham.

I have stated in the beginning of this communication that the water seldom rose in our wells to a height exceeding ten feet; but I have been informed of several exceptions to the remark, more especially in the case of the City well on Fort Hill. This well was sunk about 100 feet, when water was struck, which soon rose about fifty feet,—a level, I am told, it has since maintained. The supply also appeared abundant. The height and copious supply of this well have led to the suggestion, that if we could insert a suction into the underground stream, we could make use of the aqueduct nature has provided to bring water into the peninsula and thus, on the spot, pump up a sufficient quantity for distribution throughout the City. But, in the first place, this water is not softer than the water we now use; nor does it differ from it in any important particular: then, by pumping the water up from under the town, we should soon probably dry every well in it, that did not depend on the top water for its supply, which in fact would only be transferring the water from the wells to an iron pipe. And in the last place as it is impossible now to tell whence the under ground stream proceeds or how numerous its branches, it is not easy to say in what manner we could ascertain whether the supply would be permanently, if at all, sufficient.

There is one consideration relative to the use of river water, that ought not to be passed over in this place. I have been informed that the Thames water has been abandoned for all culinary purposes. But whether this has arisen from the circumstance that the river works have been removed together with London Bridge—whether the supply of other water has superceded it—or whether the quality of the Thames water has been essentially corrupted by the dyeing and bleaching drugs—acids and other chemical dissolvents thrown into it from manufactories, now established in great numbers on its banks, I have not been able to ascertain as precisely as I could desire. At the same time, no river water has been more celebrated, though always one of the most muddy and filthy of streams, appearing at London literally thick and black with vegetable, animal and earthy remains. There it received all the common sewers and the whole outporings, drainings and soakings of every sort and kind of that vast metropolis. Still, such an accumulation did not appear to affect the quality of the water. All these matters were held, as it is termed, in suspension and a sufficient period of rest being allowed, settled quietly to the bottom, leaving the water fresh, soft and limped. Even after six or eight months at sea the Thames water, having worked itself clear, used to be found perfectly sweet.

There are many manufactories on the banks of the Schuylkill but none nearer to Philadelphia than six miles. They are however, required by law to throw all dye stuffs and other offensive matter into vats; though it is the opinion of an excellent judge that the waters are exposed to contamination only a short distance from the works.

At any rate, from whatever external source the water shall be drawn, a very great saving in the amount required can be effected by conducting it immediately by leading pipes (called technically mains) to three principal reservoirs in the City, constructed respectively upon Beacon, Copps and Fort Hills, thence to be distributed by other mains to the service or house pipes. The situation of these eminences is equally favorable and fortunate for a purpose of that kind. This consideration is founded on the obvious and certain calculation that a large proportion of the water wanted will be used in the early part of the day, say before two o'clock—comparatively only a small quantity from that hour till nine or ten at night—after which, for five or six hours, the service or house pipes will be closed. It follows from this that if the mains, leading from the external source into the reservoir, be kept constantly running, the greatest amount of supply required will be ready at the time required. In this case, it will only be necessary to adopt the easy and simple precaution of making the mains leading from the reservoirs through the streets of sufficient size to discharge into the house pipes the required quantity of water within the required time.

Probable cost of the work.

Mr. Treadwell has given in his report an estimate of the expense of bringing 1,600,000 gallons into the City every 24 hours by three different routes. The mean of those estimates is $300,823 to which add

262,065 the cost of distribution through the streets, the same in each case; but neither including the cost of land for reservoirs on Beacon, Fort and Copps Hills. These two sums make the total expense $562,888 dollars. Mr. Treadwell's estimate applies to a population, of 50,000 with a distribution of 1,600,000 gallons making a due allowance for the probable increase of the City. But I understand from the Report that the estimate applies only to the actual cost of the works, viz:—for collecting, conducting and distributing; but is not intended to include the cost of water, water powers, mill rights, &c.

The cost of erecting the works at Fair Mount on the Schuylkill was $426,330. Of this amount $331,000 was expended in purchasing a river right of an incorporated Company and a water power of two individuals. Philadelphia is advantageously situated for a copious and ready supply of running water, the water itself with a water power sufficient to raise it 90 feet into a reservoir being both near at hand. Yet under these favorable circumstances the expense alone of collecting the water was $426,000.

We also know how often it is unhappily true that expenditures in extensive enterprizes, whether public or private, outstrip the estimates. And what sums of money the details of a great work, so difficult in all cases, in some impossible, to anticipate, lamentably absorb and devour. If therefore, to the heavy items of positive expense I have above enumerated, we add the general consideration I have just alluded to, (reckoning it for what it is worth,) and also the fact that the City will, probably require at least 2,000,000 of gallons, I believe that the cost of water works of ample dimensions and of a solid substantial structure will be found to fall not much short of one million of dollars. Still in my judgment it would be immediately a wise and salutary and eventually a profitable undertaking, even if the cost rose to a higher sum, *provided we do not doubt that plenty of pure and soft water would add to the health and comfort, the cleanliness and convenience of our people.*

We pay vast sums every year to build drains and sewers to conduct away the filth that would otherwise accumulate on the surface. By this process we annually improve the health of all and save the lives of some of the citizens. Yet this cannot be called money ill spent. We also at a great expense maintain our public Schools in a flourishing as well as improving state ;—we establish houses of industry or of reformation ;—we provide even and solid pavements ;—and we foster and cherish the spirit and enterprize of the Fire Department. These are all items of expense that belong to a civilized and enlightened condition of society and if we wish to enjoy the benefits and advantages to be derived from it, we must consent to pay for them.

It is true that we have thus far lived in health and comfort, getting water as we could, but I am persuaded that if we once had pipes running into our rooms, chambers, kitchens, entries, yards, passage ways, &c. yielding soft water without end, just by turning a fascet, not only no amount of money would induce us to give up the privilege, but we should think it impossible to exist without it.

The comforts and conveniencies of life are surely to be found in the most approved form and ready way in that community, which is the best regulated, where the citizen feels that he is secure in his person, rights and property and where the general tone is the most orderly, quiet and respectable. Nor can this state of things well or long exist where any matter is omitted or neglected, that essentially and permanently contributes to the universal morals—the education—the security—the health and the comfort.

I have seen a statement by which it appears that $273,750 are yearly paid in New York for soft or tea water brought into that City in hogsheads, though costing only one cent a gallon when delivered. This sum would probably pay the interest of a capital that would supply every house in that City to the highest story with the best running water and in the greatest profusion. If then in our own City we could calculate the time spent in pumping water from bad or frozen pumps,—in fetching it from a distance,—in carrying it up stairs,—using bad water in cooking or washing,—the expenses of repairing pumps and cisterns,—to say nothing of the discomfort of using bad water in some cases and in others not having enough to use;—If these matters, by and in themselves insignificant and little observed, could be reduced to a single sum in federal money, it would be found, I believe, to amount to a greater one than is required to pay the interest of the cost of ample and solid water works.

All commercial cities are obliged to bid more or less for inhabitants from the country. Pure and good water cannot be placed low in the list of inducements or temptations to any class of persons to settle in a place. And it should be observed that every accession of population adds to the value of land and of every description of property.

All the new lands properly so called, such as the extensive tracts on the Mill Pond and in the direction of the Neck, will especially and immediately feel the benefit and advantages of a supply of good water. The City has, also, a direct interest in promoting this enterprize, for the sake of adding to the value of this description of our public property. It is the opinion of many well informed persons that plenty of water, distributed through the City Lands, would so far enhance their value as to furnish in a few years a fund sufficient eventually to redeem not only the present City Debt but any one we should be likely to contract for an Aqueduct.

The nature of this communication and the propriety of compressing my remarks into as narrow a compass as a becoming regard to the subject will admit of, will not permit me to enter into details and minute calculations, though in fact numerous, readily occuring and capable of being presented in a form not only serving to illustrate but also to strengthen in an eminent degree the argument in favor of the wisdom and expediency of this measure;—I refer especially to the expenses yearly incurred for the renewal or repairs of pumps and cisterns—to the cost of the wells and cisterns that it will, hereafter, be necessary to build unless a different provision is made to supply the inhabitants with water and to the great saving effected by a reduced rate of insurance. These sums combined would probably amount in a short time to more than the cost of an Aqueduct.

I shall, however, here annex in the shape of an appendix, marked A. B. C., three estimates, selected from Mr. Treadwell's report, of the cost of bringing water from the falls at Watertown and Spot-pond and of, also, distributing it through the streets. Not only the expense of this sort of undertaking but in general the kind of work required will be well understood and appreciated by these extracts. I take the same opportunity to say that a copy of Mr. Treadwell's valuable report will be found on the files of the City Clerk's Office.

Advantage in Fires.

The Fire Department have now 29 plugs from the Jamaica Pond Aqueduct, 30 fresh water reservoirs constructed at the public expense, 8 other reservoirs or public wells, and 25 private wells, reservoirs, and tubs in Distil houses, from all which water can be drawn by a suction hose. It is, therefore, supposed that the defence of the town against fire is nearly as complete as the nature of this sort of supply can make it. At the same time, it is obviously a mode of protection vastly inferior to plugs, placed at short intervals along the streets, affording an immediate, copious and really inexhaustible rush and flow of water, rising, perhaps, by its natural jet to the top of the buildings. Besides, it is important to remark that we now depend to a very great extent for our security and protection upon the alacrity, activity, enterprize and perseverance of the Fire Department. But if owing to a series of untoward circumstances it should so happen that the laudable pride of this association and its becoming and animating sense and spirit of discipline and subordination should, hereafter, unhappily decline and decay, we should probably soon find that reservoirs with hired men on the brakes would after all furnish forth, at the best, but an inadequate security, without including the vast expense for wages. As a general remark, it seems, therefore, to amount to a demonstration that, just in proportion to a ready and copious supply of water will be the facility and certainty with which fires are extinguished. The ultimate but unfailing effect of this on rates of insurance can be easily estimated.

Probable Income.

Little can be said concerning this branch of the subject. I have already spoken of the actual supply of water from wells, cisterns and the Jamacai pond. How much this would interfere with another supply does not yet appear susceptible of being stated with much precision. At any rate, the experience of other Cities, where the habits of the people are substantially like our own, need not discourage us. The London Water Company Stocks have turned out so profitable that the competition is extreme. The Fair Mount reservoir already yields a great income to the City of Philadelphia and it increases at a regular rate, so much so as to afford a certain sum for the redemption of the debt, notwithstanding the loss of a very large amount in a mistaken construction of the original works. "There is no one thing" (says a gentleman of that City thoroughly acquainted with the history of the works) "in which all are so much united, and I firmly believe that if the question were to be submitted to the citizens to sell to a company that should pay back the cost with interest, that not a tenth part of the population would agree to it. The increased security from fire, the abundant supply for washing the streets—the copious streams afforded for baths—for cleanliness—for washing in general, &c. and in short many other advantages are such and so well appointed that no money could purchase the vacation of the works."

The same writer adds—"The whole cost of the water works, including the pipes for distribution, previous to the erection of the new water power (1822) was 1,138,857 dollars without adding the interest, and yet such was the eagerness for a more abundant supply that a unanimous sanction was given to the new plan, (Fair Mount, 1822,) which has happily succeeded in raising the water by water power, the cost of which may be put down, including purchase of the river rights, at $426,000. In addition to this iron pipes are substituting for those of wood, the cost of which thus far (1825) may be called $150,000—in all nearly $600,000."

Since the new power was established in 1822 at Fair Mount, the City (as I learn from a printed report) has enjoyed the advantage of a profuse supply without the intermission of a single day. In the same report there is a list of some of the places supplied. I shall make a short extract from it, showing on a small scale how extremely and extensively useful a good supply may become. Horses, baths, Porter cellars, Dwelling houses, (different sizes) Soap factories, Taverns, Courts, Steam mills, Tan houses, Victuallers, Stables, Hatters, Breweries, Dyers, Distillers, Sugar houses, Printing offices—to wash side walks and lanes, &c.

A work of this description may prove expensive, or may be much protracted. Still in the present state of philosophical and mechanical knowledge, it cannot be called even difficult though laborious without doubt. The formula, by which the rates of velocity and discharge, &c. of water are estimated;—

the size and thickness of pipes,—form of joints,—air valves, &c.—all these matters are now well proved and thoroughly established, having been applied to a great extent in London, Philadelphia and other cities.

It is probable that a careful and thorough survey and examination of the vicinity, both as to quality and quantity of water and practicability of routes, can be performed early enough in the season to allow a full and minute calculation of the expense of a work of this description (if practicable) to be prepared by the beginning of the Summer. And even if ready at an earlier period, the close of the next season would probably be a more favorable period for commencing the enterprize. The three rail ways, leading from Boston, it is understood, will be completed or substantially so by that time, and I am not aware that any other great work is now projected. The city would therefore not meet any other competition on the score of labor and capital than will necessarily arise in the course of the regular and ordinary business of the country.

In regard to the survey, the expense and time required for it will be much lessened by the circumstance that three lines of levels have been established by the rail ways now building from town. These cross the country in those directions, whence it is most likely the water will be brought. The levels can easily be transferred from those to intermediate points.

It is exceedingly desirable, nay necessary, that final measures should be adopted in regard to this business of bringing water into the City. Every year's delay adds to the expense as well as to the difficulty of the undertaking. The sources in the Country will be more occupied with Mills or Manufactories and the routes to the City more covered with improvements. In town, too, the land for reservoirs and other purposes is not only dearer and less abundant, but has already been and will continue to be occupied with buildings it will prove both difficult and expensive to remove.

On numerous accounts and for very strong reasons it would not seem wise and judicious to permit this work to go out of the hands and control of the Corporation, though it is well understood that there are individuals, inspiring every necessary degree of confidence both on the score of capacity and capital, that stand ready to undertake it. But to the inhabitants of a City water is equally the greatest necessary, and the greatest luxury of life. It would not, therefore, appear to be a sound or a prudent policy to surrender to individuals the right and franchise of supplying an article so universal and indispensable in its nature. If the enterprize is likely to be attended with profit, there is surely no reason why the Corporation should not hold and enjoy the benefit of it. If on the contrary unsuccessful and in the hands of private persons, even if it is according to the course of things, that in general the public suffer little in consequence of the mistakes or bad calculations of individuals, yet in a case of this sort the citiizens at large could not expect to escape great damage and discomfort by being deprived, perhaps, altogether of water or by a pinched and niggardly supply of it. Difficulties would also probably arise in furnishing water for the fire-engines. This has repeatedly happened in London where all the works are in the hands of private companies, not, however, from a want of water but from an unwillingness to deliver it.

In this communication it has not been my intention to prepare simply an argument in favor of bringing water into the City. I have not thought this demanded either by the subject or the occasion. On the contrary, it has been my endeavour to give an account of the whole matter, both as to present and projected supply, limited, of course, to general considerations, arranged in an abridged form. Still as this work will prove expensive and will require time and great labour and attention, I should not think it desirable to undertake it, before the subject had been presented to the people, assembled in town meeting, for their examination and approbation.

I now recommend to the early and earnest attention and consideration of the City Council the subject of bringing a copious and steady supply of pure and soft water into the City of Boston.

THEODORE LYMAN, Jr.

January 29, 1834.

In Common Council, January 30, 1834,

The foregoing Message was received from the Mayor, and ordered to be printed.

RICHARD G. WAIT, *Clerk.*

APPENDIX.

(A)

An Estimate of the cost of the various works required to supply the City of Boston with 1,600,000 *gallons of water, daily, from Charles River, taken above the Falls at Watertown Bridge.*

Cost of a reservoir near the Falls in Watertown, in which the water may deposite any earthy or vegetable matter mixed with it. The reservoir to be 1000 feet long and 200 feet wide, by 5 feet deep; having an area of 4.95 acres, and capable of holding 1,000,000 cubic feet of water.

Cost of Land, 6 acres, at $300 per acre,	$1,800	
" " Digging 2,777 squares at $1 per square,	2,777	
" " Walls 3 feet thick at bottom, 2 feet at top, containing $2,061 perch of stone at $2 a perch,	4,122	
" " Fence 10 feet high enclosing the reservoir.	1,000	
		$9,699

Cost of two wooden, cylindrical trunks, 2½ feet internal diameter, 29,020 feet long, each, made of pine plank, 2 inches thick, hooped with cast iron, for bringing the water from Watertown, to a point on the Milldam, west of the sluice way of the full basin.

Cost of Plank, 580,400 feet, at $40 per thousand,	$23,216
" " Cast iron hoops, in number, 17,412, weight, 27 lbs. each, at 4 cts. per lb.	18,805
" " Work in making the trunks, including the carting all the lumber, and laying the trunks in the trench, 22 cts. per foot, in length,	12,769
" " Land through which the trunks will pass, exclusive of the reservoir, being 29,020 feet long and 16½ feet wide 10.99 acres at $250 per acre,	2,748
" " Digging the trench for the trunks, and filling up, after the trunks are laid, 7000 squares, at $1,50 per square,	10,500
" " Clay, 7010 tons, and carting it to the trench and placing it round the trunks,	7,010
" " Piles (say for 2 miles) consisting of 2 piles and a cross piece every 4 feet, at $1,50 each set,	3,960
" " Building culverts, removing stones, building and repairing walls and fences in passing inclosures, and securing trunks passing in roads,	5,000
	$84,008

Cost of an iron pipe, and laying it, to carry the water, from the trunks, to the pumps in the mills.

Cost of Iron pipe 300 feet long 18 inches diameter, wt. 170 lbs. per running foot, at 4 cents per lb.	$2,040	
" " Piles and laying the pipe, including digging, and removing the walls of the dam and repairing them,	700	
		$2,740

Cost of Mills and Machinery for forcing the water, delivered by these trunks, from the Milldam into a reservoir on Beacon hill.

Cost of Water power for 8 water wheels and land for Building ; Rent being $315 each wheel, $2,520 per year. The capital required to give this sum at 5 per cent interest is	$50,400
Cost of a Stone Building 100 feet by 90 ; walls 15 feet high 2 feet thick ; roof covered with copper.	
" " Wall with the foundation walls 921 perch of stone, and laying, at $4,	3,684
" " Cross walls for supporting the wheel 573 perch of stone $4,	2,292
" " Piles, 900 at $1,50 each,	1,350
" " Bulk heads, Timber for flooring walls, and work. Planks for covering timber,	2,340
" " Roof, uncovered, Doors, Windows, and Sky lights,	2,000
Amount carried over,	$62,066

Amount brought over,	62,066	
Cost of Coppering Roof,	5,000	
" " Flooms, to carry the mill water through the dam,	3,200	
		$70,266

Cost of Mill work, Wheels, Pumps and other machinery in the mill.

Cost of 8 Water Wheels, with geering segments, Gates, Breasts, Headstocks and Boxes, the Wheels being 9 feet diameter and 16 feet long.	$12,000	
" " Two Flooms of stone 90 feet long, 13 high, 20 wide, with stone floor.	4,660	
" " Eight Water wheel aprons of stone,	2,340	
" " Reservoir in the mills, supplying the forcing pumps,	830	
" " Twelve single forcing pumps, with all the geering and machinery necessary to take motion from the Water wheels. The pumps united to an iron main pipe through which the water shall pass to the pipe in the road in front of the Mills. The above put up ready to run,	8,100	
		$27,930

Cost of an iron pipe, 14 inches diameter, to lead the water from the Mills to a reservoir on Beacon hill; distance 1⅝ miles.

Cost of Pipe 7623 feet long, including the laps at the joints, 14 inches diameter, wt. 101 lbs. per running foot, at 4cts. per lb. delivered at the trench,	$30,797	
" " Lead for 726 joints, 31 lb. per joint, at 7 cts. per lb.	1,575	
" " digging a trench and covering the pipe, 7260 ft. long, 3½ wide, 5½ deep, 647 squ. at $2,	1,294	
" " Laying pipe, 726 joints at $1,50 each joint,	1,089	
" " Air cocks and appendages,	400	
		$35,155
		$229,798
Add to the above, for contingent expenses, 10 per cent.		22,979
Whole amount,		$252,777

(B)

An Estimate of the cost of an Iron Aqueduct capable of supplying 1,600,000 *gallons of water, daily, passing from Spot-pond, through Medford, Charlestown, and Cambridge-port, and across Charles river, near Cragie's bridge, to a Reservoir on Beacon hill. Distance* 7 *m.* 2*f.* 20 *r. or* 38,610 *feet,*

Cost of Iron Pipe 40,541 feet in length, including the lap of the joints, 16 inches diameter in the bore ; wt. 134 lb. each foot in length, at 4 cts. per lb. delivered at the trench,	$217,300
Cost of extra thickness of that part of the pipe exposed to the salt water in passing rivers,	7,200
" " Lead for filling at 3,861 joints, 36 lbs. each, at 7 cts.	9,730
" " Air cocks and appendages,	1,800
" " Digging a trench 2 miles from the pond, equal to 7 feet deep, 3½ feet wide, including ⅛th of a mile deep cutting. The whole through rough land. 1198 squares, at $3.	3,594
" " Digging the remaining 5 m. 20 r. (exclusive of the channel at Cragie's bridge,) good land for most of the way, 6 feet deep, 3½ wide, 2599 squares, at $1,50,	3,899
Amount carried forward,	**243,523**

Amount brought forward,	243,523	
Cost of Piles across the flats at Cragie's bridge, and several pieces of marsh, 1 mile, 528 pairs of piles, and an equal number of cross pieces, at $3 each,	1,584	
“ “ Crossing Mystic river and Middlesex canal,	3,000	
“ “ Crossing the deep water at Cragie's bridge,	14,000	
“ “ laying the pipe in the trench, and filling lead at the joints, 3861 joints, at $1 50 each,	5,792	
“ “ Land through which the pipe will pass, being 5 miles long, and 12 feet wide (the remaining distance being in public roads and through rivers,) 7.27 acres, at $200 per acre,	1,454	
		$269,353
Add to this amount, for contingent expenses, 10 pr. ct.		26,935
Whole amount,		$296,288

(C)

An Estimate of the cost of Reservoirs, on Beacon, Fort and Copps hills, and of distributing 1,600,000 *gallons of water, daily, from them. The cost of the land required for the reservoirs not included.*

Cost of three reservoirs, each 100 feet square, 8 feet deep, capable of of holding 240,000 cubic feet of water.

Cost of hammered stone for the walls, 14,400 feet, at 60 cts. per foot laid,	$8,640	
Cost of Floor for the reservoir on Beacon hill, the soil being sandy, 10,000 feet, 4 inches thick, at 16 cts. per foot,	1,600	
“ “ Stone fences round each reservoir 12,000 feet of stone, at 60 cts. per foot, laid,	7,200	
		$17,440

Cost of an iron pipe through all the streets laid down in “ Hale's survey of Boston,” making an aggregate length of 116,190 feet.

Cost of 20,000 feet of pipe, 8 inches internal diameter, wt. 48 lbs. per foot, at 4 cts. per lb.	$38,400	
“ “ 400,000 feet of pipe, 6 inches internal diameter, wt. 36 lbs; per foot, at 4 cts. per lb.	57,600	
“ “ 62,000 feet of pipe 4 inches internal diameter, wt. 20 lbs per foot, at 4 cts. per lb.	49,600	
		$145,600

These lengths include the lap at the joints.

Cost of Lead for 1,904 joints, 8 inch, wt. each, 18 lbs. at 7 cts.	$2,399	
“ “ Lead for 38 08 joints, 6 inch. wt. each 13½ lbs. at 7 cents,	3,599	
“ “ Lead for 5,904 joints, 4 inch, wt. each, 8½ lbs. at 7 cts.	3,513	
“ “ Stop cocks and fire cocks,	10,500	
“ “ Digging 116,190 feet in length, 4½ feet deep, through the streets, for laying the pipe, at 35 cts per running foot; including filling up after the pipe is laid, and repaving,	40,66	
“ “ Laying the pipe 11,619 joints at $1,25 each,	14,524	
		$75,201
		$238,241
Add to the above, for contingent expenses, 10 per cent,		23,824
Whole amount,		$262,065

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